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10/584,307	06/23/2006	Shinya Tanaka	2006_0832A	9023

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WENDEROTH, LIND & PONACK, L.L.P.  
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SUITE 800  
WASHINGTON, DC 20006-1021

EXAMINER
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MCCULLEY, MEGAN CASSANDRA

ART UNIT	PAPER NUMBER
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1796

MAIL DATE	DELIVERY MODE
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09/17/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/584,307	<b>Applicant(s)</b> TANAKA ET AL.	
	<b>Examiner</b> Megan McCulley	<b>Art Unit</b> 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 August 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-8 and 10-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-8 and 10-12 is/are rejected.
- 7) ☒ Claim(s) 1,3-8 and 10-12 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/20/2008</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Objections***

Claims 1, 3-8 and 10-12 are objected to because Ar is an art recognized symbol for an aromatic group, while in the claims it does not represent an aromatic group.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 and dependent claim 10 depend on claim 2, which is a canceled claim. For the purpose of further examination, claim 3 is taken to be dependent on claim 1.

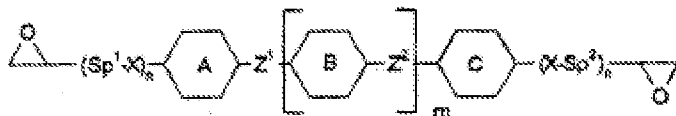
### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 3, 5, 7, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998).



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Regarding claims 1 and 3: Joliffe et al. teaches the compound:



(page 6, line 25) in which  $Sp^1$  and

$Sp^2$  can be  $(CH_2)_o$  where  $o$  is 2-12 (page 13, lines 20-25),  $X$  can be  $O$  (page 5 line 32),  $n$  can be 1 (page 5 line 27),  $Z_1$  and  $Z_2$  can be single bonds (page 5 lines 20-25),  $m$  can be 1 (page 5 line 26) and groups  $A$ ,  $B$ , and  $C$  can be 1,4-cyclohexenylene or 1,4-phenylene (page 5 lines 15-16). It is further disclosed the instance where  $A$  is phenylene,  $B$  is 1,4-cyclohexenylene, and  $C$  is phenylene (page 8, 2-11, line 25).

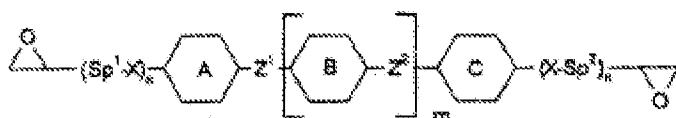
Not disclosed is where the double bond occurs in the 1,4-cyclohexenylene ring, i.e. ring  $B$ . However, Bezborodov et al. teaches that liquid crystals with a 1,4-cyclohexenylene derivative  produces higher values of nematic-isotropic liquid phase transition temperature ( $T_{N-I}$ ) and crystal-nematic phase transition temperature ( $T_{C-N}$ ) and a lower value of the nematic range ( $\Delta T$ ) than liquid crystals with a 1,4-cyclohexenylene derivative  (See table 2, section 2 paragraphs 1 and 2, table 3 and section 2 paragraph 6). Joliffe et al. and Bezborodov et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal polymers with 1,4 cyclohexenylene rings. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the double bond placement disclosed in Bezborodov et al. with the polymer disclosed in Joliffe et al. and would have been motivated to do so for such desirable properties as higher working temperatures which may be necessary for some applications.

Regarding claims 5 and 10: Joliffe et al. teaches a polymerization initiator/curing agent (page 20 lines 10-12).

Regarding claim 7: Joliffe et al. teaches a crosslinked/cured product (page 19 lines 30-35).


Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) in further view of Mormann et al. (U.S. Pat. 5,569,727).

Regarding claim 4: Joliffe et al. teaches the compound:




(page 6, line 25) in which  $Sp^1$  and

$Sp^2$  can be  $(CH_2)_o$  where o is 2-12 (page 13, lines 20-25), X can be O (page 5 line 32), n can be 1 (page 5 line 27), Z1 and Z2 can be single bonds (page 5 lines 20-25), m can be 1 (page 5 line 26) and groups A, B, and C can be 1,4-cyclohexenylene or 1,4-phenylene (page 5 lines 15-16). It is further disclosed the instance where A is phenylene, B is 1,4-cyclohexenylene, and C is phenylene (page 8, 2-11, line 25).

Not disclosed is where the double bond occurs in the 1,4-cyclohexenylene ring, i.e. ring B. However, Bezborodov et al. teaches that liquid crystals with a 1,4-cyclohexenylene derivative  produces higher values of nematic-isotropic liquid phase transition temperature ( $T_{N-I}$ ) and crystal-nematic phase transition temperature

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( $T_{C-N}$ ) and a lower value of the nematic range ( $\Delta T$ ) than liquid crystals with a 1,4 cyclohexenylene derivative  (See table 2, section 2 paragraphs 1 and 2, table 3 and section 2 paragraph 6). Joliffe et al. and Bezborodov et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal polymers with 1,4 cyclohexenylene rings. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the double bond placement disclosed in Bezborodov et al. with the polymer disclosed in Joliffe et al. and would have been motivated to do so for such desirable properties as higher working temperatures which may be necessary for some applications.

Not disclosed is the method of making the compound. However, Mormann et al. teaches a similar liquid crystal diepoxide made by a method of reacting the corresponding diol (middle cyclic structures which has two terminal OH groups as does instant formula at the top of page 4 of the claims) with epichlorohydrin (which is of the instant formulas at the top and bottom of page 5 of the claims) in the presence of benzyltrimethylammonium bromide, which is basic (example 1). At the time of the invention a person having ordinary skill in the art would have found it obvious from the teachings of Mormann et al. that to make the compound disclosed in Joliffe et al., the procedure disclosed in example 1 would be modified by replacing the hydroquinone bis(4-hydroxybenzoate) with the diol corresponding to formula at the top of page 4 of the claims. Joliffe et al. and Mormann et al. are analogous art since they are both concerned with the same field of endeavor, namely diepoxy liquid crystals. At the time of the invention a person having ordinary skill in the art would have found it obvious to

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combine the method of making disclosed in Mormann et al. to make the compound disclosed in Joliffe et al. and would have been motivated to do so to make a diepoxide liquid crystal with the properties of the Joliffe et al. compound.

Claims 6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) as applied to claims 1 and 5 above and in view of Schoenfeld et al. (U.S. Pat. 6,143,379).

Regarding claim 6: Joliffe et al. teaches the basic claimed composition as set forth above. Not disclosed is the curing agent of 4,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylethane, 1,5-diaminonaphthalene or p-phenylenediamine. However, Schoenfeld et al. discloses a liquid crystal polyepoxy with aromatic constituents (col. 2 lines 37-52) comprising p-phenylenediamine (col. 3 lines 18-25). Joliffe et al. and Schoenfeld et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystalline epoxies. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the curing agent disclosed in Schoenfeld et al. with the composition disclosed in Joliffe et al. and would have been motivated to do so for such desirable properties as pronounced color effects and appearance, as evidenced by Schoenfeld et al. (col. 1 lines 1-30).

Regarding claim 11: Joliffe et al. teaches a crosslinked/cured product (page 19 lines 30-35).

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) as applied to claims 1 and 5 above and in further view of McCormack et al. (U.S. Pat. 6,326,555).

Regarding claim 8: Joliffe et al. teaches the basic claimed composition as set forth above. Not disclosed is a prepreg obtained by applying or impregnating the composition to or into a base material followed by semi-curing. However, McCormack et al. teaches a partially cured prepreg comprising liquid crystal epoxy. Joliffe et al. and McCormack et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal epoxies. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the composition of Joliffe et al. with the product of McCormack et al. and would have been motivated to do so because prepregs are a known epoxy applications considering the adhesiveness and ease of handling of epoxy resins.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Joliffe et al. (GB 2338240) in view of Bezborodov et al. (Liquid crystalline 1,4-disubstituted cyclohexenylene derivatives, Journal of Liquid Crystals, Sept. 17, 1998) and in view of Schoenfeld et al. (U.S. Pat. 6,143,379) as applied to claims 1, 5 and 6 above and further view of McCormack et al. (U.S. Pat. 6,326,555).

Regarding claim 12: Joliffe et al. teaches the basic claimed composition as set forth above. Not disclosed is a prepreg obtained by applying or impregnating the

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composition to or into a base material followed by semi-curing. However, McCormack et al. teaches a partially cured prepreg comprising liquid crystal epoxy. Joliffe et al. and McCormack et al. are analogous art because they are both concerned with the same field of endeavor, namely liquid crystal epoxies. At the time of the invention a person having ordinary skill in the art would have found it obvious to combine the composition of Joliffe et al. with the product of McCormack et al. and would have been motivated to do so because prepregs are a known epoxy applications considering the adhesiveness and ease of handling of epoxy resins.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 3-8 and 10-12 have been considered but are moot in view of the new ground(s) of rejection.

However, the following remarks are in regard to applicant's arguments directed to the GB 2338240 reference. Applicant's argument that Joliffe et al. does not teach specific disclosure of the epoxy compound of the present invention is not persuasive. Joliffe et al. teaches a limited number of possible, predictable moieties for each of the variables within the polymer, especially the three ring structures in the exact order as the instantly claimed polymer. Many of the Sp variable choices given in Joliffe et al. overlap with the claimed Q<sup>3</sup> group. While the reference does not show the instant structure, the claimed structure is encompassed by the teaching and a person having ordinary skill in the art would recognize there is a finite number of identified, predictable possibilities from which to choose a liquid crystal polymer.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

### ***Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Megan McCulley whose telephone number is (571)270-3292. The examiner can normally be reached on Monday - Friday 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Eashoo can be reached on (571) 272-1197. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Eashoo, Ph.D./  
Supervisory Patent Examiner, Art Unit 1796  
13-Sep-08

/M. M./  
Examiner, Art Unit 1796